(12) UK Patent Application (19) GB (11) 2 161 731 A

(43) Application published 22 Jan 1986

(21) Application No 8517825

(22) Date of filing 15 Jul 1985

(30) Priority data

(31) 8418101 (32) 17 Jul 1984 (33) GB

(51) INT CL⁴
E02D 7/06

(52) Domestic classification
B3H 4BX 4Q
U1S 1764 B3H

(56) Documents cited

GB A 2035866	US 3958647
GB 1576977	US 3721095
GB 1570707	US 3635292
GB 1476570	

(58) Field of search
B3H

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(54) Pile driver

(57) To reduce bounce and excessive noise produced when employing presently constructed devices, the pile driver is provided with hydraulic rams 9 acting on wedges 8 for clamping the end of a pile 3 during the pile driving operation thereby damping the vibrational effects of the applied impact, and maximising the penetrating efficiency.

The required pressure to operate the rams 9 is generated when weighted piston 2 impacts an oil cushion 4 thereby forcing oil into the hydraulic rams 9 and effecting the required clamping.

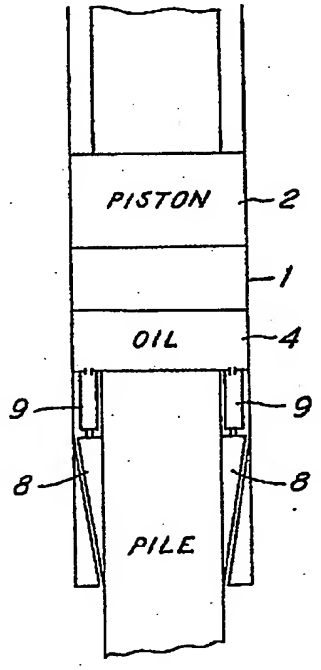

FIG.2

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

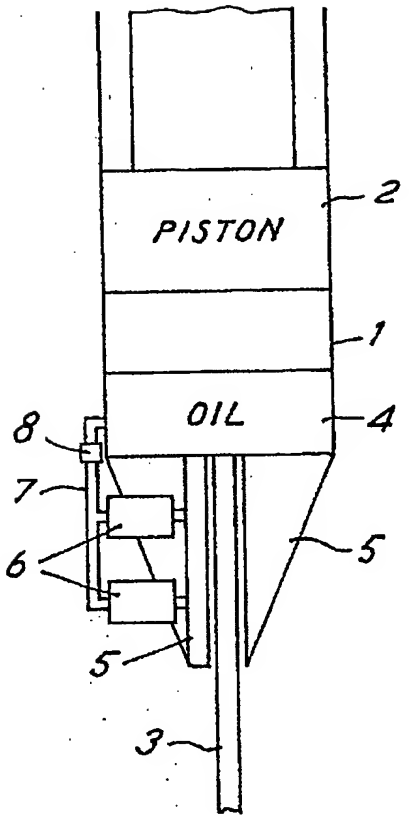

FIG.1

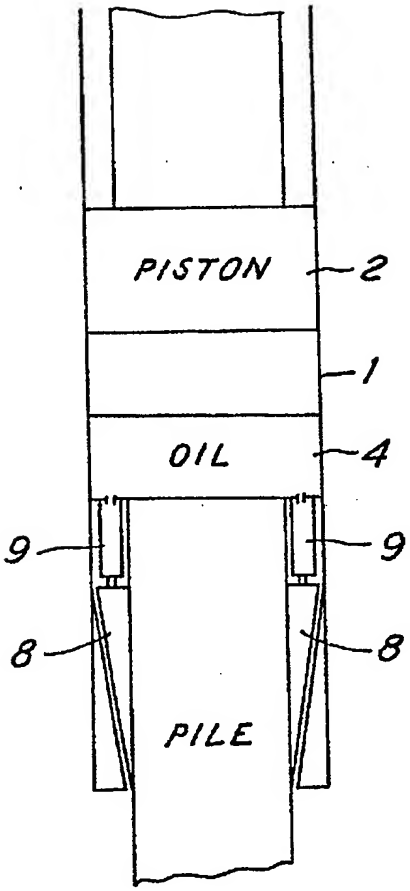

FIG.2

SPECIFICATION

A device for applying an impact

The present invention relates to a device for applying an impact and particularly but not exclusively to a pile driving device for applying intermittent impacts to drive piles into the ground.

Pile driving devices in present use suffer from at least two disadvantages both of which are in a sense inter-related, namely a reduction in the driving efficiency of the pile driving hammer due to excessive dissipation of energy at impact, and secondly a high intrusive noise level occasioned in part at least by the first disadvantage referred to.

Both these problems have been reduced to a large degree by a pile driving device protected by UK patent 2035866 and incorporated herein by reference. Such a pile driver comprises an anvil abuttable with the top of the pile being driven, and a weighted piston movable in a cylinder intermittently to impact the anvil and so drive the pile. To reduce energy loss and noise, a liquid cushion, preferably oil, is interposed between the piston and the anvil, so that the impact force to the pile takes place through the cushion of oil.

However this arrangement does not entirely solve the problems of energy loss and loss of penetrative energy caused by pile sway and vibration during impact, and the creation of resultant noise and clatter.

It is an object of the present invention to eliminate these problems and so provide a pile driving device which is more energy efficient and free, as far as practically possible, of the environmental problems of noise.

According to the invention there is provided a device for driving a pile comprising a pile driving hammer, and guide means for guiding the hammer intermittently to impact a pile characterised in that the device is provided with means for clamping the free end of the pile during impact.

This arrangement is advantageous in that it effectively mechanically couples the piling hammer to the pile being driven so that the pile is maintained in alignment with the path of travel of the driving hammer at all times so reducing or eliminating pile sway and vibration, relative to the driving hammer, which would otherwise develop noise and cause loss of penetrating energy supplied by the pile driving hammer.

In the event that the pile driving device is of the type where the impact to the pile takes place through a liquid cushion, the clamping means may be hydraulically operated by the pressure build-up in the oil cushion upon impact of the pile hammer.

In this arrangement the clamping means may be actuated by a pair of hydraulically operated rams connected through non-return valves to the oil cushion so that the pile is gripped in the vicinity of impact, at initial impact by the piling hammer, and retained in the clamped position until pile driving is complete.

The clamping members may be in the form of ram operated wedges, the rams applying a hydraulic force in the longitudinal direction of the pile to set the wedges, or in the form of simple clamping elements to either side of the pile and movable into a clamping position by the rams which provide a force transverse to the driven pile.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawing wherein:

Figure 1 is a sectional view through a pile driving device according to one embodiment of the invention; and

Figure 2 is a sectional view through a pile driving device according to another embodiment of the invention.

The pile driving device shown in both Figures 1 and 2 of the drawings comprises a cylinder 1 provided with a weighted piston 2.

The piston 2 is intermittently movable in the cylinder 1 to apply an impact to a pile 3 to be driven into the ground, through an oil cushion 4 disposed at the bottom of the cylinder 1.

With reference to Figure 1, a pair of clamping members 5 are attached to the base of cylinder 1 for movement transversely to a clamping position around the top of the pile 3.

The clamping members 5 are moved into the clamped or gripping position by means of hydraulic rams 6, which operate under hydraulic pressure supplied through ducting 7 from the oil reservoir 4 to the bottom of the cylinder 1.

The required pressure to operate the rams is generated when the pistom 1 impacts the oil cushion 4, a non-return valve 8 being provided in the ducting 7 between the oil reservoir and the rams 6, so that after an initial impact the clamping members 5 may be retained in their clamped position during a pile driving operation. When piling is complete pressure in the rams 6 is released and the clamping members 5 are urged to their original position by means of springs (not shown).

In the modification shown in Figure 2, the clamping members are in the form of wedges 8 similarly driven by hydraulic rams 9 providing a hydraulic force to drive the wedges 8 to their wedged position, and clamped around the pile, acting longitudinally of the driven pile 3.

In the embodiments shown hydraulic pressure to operate the clamping members is provided from the oil reservoir through which the impacting force to drive the pile is transferred to the driven pile.

By means of the arrangements above described, vibration of the pile during a pile driving operation, otherwise present in prior devices, is considerably damped thus reducing bounce and emitted noise this, at the same time, improving considerably the penetrating efficiency of the device as a whole.

By utilising the hydraulic pressure build-up in the oil cushion 4, it is a very simple expendient to monitor this pressure by means of a pressure transducer in the side of the cylinder 1. This will determine the precise energy imparted to the pile on each and every impact operation.

This information coupled with an accelerometer can give a print-out reference of every pile driven by a contractor.

This will obviate the necessity of testing piles after installation, which is a very expensive and time-wasting operation.

CLAIMS

1. A device for driving a pile comprising a pile driving hammer, and guide means for guiding the hammer intermittently to impact a pile characterised in that the device is provided with means for clamping the free end of the pile during impact.

2. A device as claimed in claim 1 wherein the hammer and guide means is constituted by a weighted piston moving in a cylinder, and said clamping means comprises a pair of clamping members attached to the cylinder and operable to grip the top of a driven pile during impact.

3. A device as claimed in claim 2 wherein a liquid cushion is arranged in the cylinder such that the piston applies an impact to the pile through the liquid cushion, said clamping members being hydraulically operable in response to the pressure set up in said liquid cushion upon impact by said hammer.

4. A device as claimed in claim 3 wherein the liquid cushion is oil, a pair of hydraulic rams being provided for operating the clamping members, which rams operate in response to pressure build up in said oil cushion upon impact of the hammer therewith.

5. A device as claimed in claim 4 wherein the clamping members are in the form of wedges to either side of the pile being driven, and being movable to a pile clamping or gripping position in wedging relationship against the pile by means of said rams.

6. A device as claimed in claim 5 wherein a non-return valve is provided between said oil cushion and said rams to enable the clamping members to be retained in the clamped or gripping position throughout a piling operation subsequent to an initial impact stroke of the hammer.

7. A device as claimed in any one of claims 3 to 6 wherein pressure transducer means is provided for monitoring pressure build-up in said oil cushion thereby to determine the energy imparted to the pile at each impact.

8. A device as claimed in claim 7 wherein said pressure transducer means is in the side of said cylinder.

9. A device for driving a pile substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

Printed in the UK for HMSO, D8818935, 12/85, 7102.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.